

HORTICULTURAL ABSTRACTS.

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No. 2.

IN the present number certain changes have been made both on the cover and in the order and arrangement of contents, which will, it is hoped, conduce to a quicker finding of any particular section. It will be noted that at the head of each page will be found on the top left hand corner the main division and on the right hand corner the particular subject dealt with by abstracts on that page. Other suggestions have been noted for attention in volume 2.

INDEX OF CONTENTS.

HORTICULTURE—MISCELLANEOUS	Nos. 111-119
*TREE FRUITS, DECIDUOUS	120-159
Selection	120-121
Propagation	122-124
Rootstocks	125-134
Growth, Nutrition, etc.	135-137
Pollination	138-144
Manuring	145-149
Cultural practices	150-154
Plant protection	155-159
*SMALL FRUITS, VINES AND NUTS	160-169
*CITRUS AND SUB-TROPICAL FRUITS	170-180
*TROPICAL CROPS :.	181-196
STORAGE	197-202
PACKING—PROCESSING—FRUIT PRODUCTS	203-215
BOOK NOTES	216-219

* See also under STORAGE and PACKING.

Horticultural Abstracts

Vol. I

June, 1931

No. 2

HORTICULTURE—MISCELLANEOUS.

111. **Campbell, J. A.** 634.1/2(931)

Fruitgrowing in New Zealand.

J. New Zealand Inst. Hort., 1930, 2 : 1-5, 29-32, 61-5.

In the first two parts of his article the author discusses points that must be considered by those intending to grow fruit commercially in New Zealand, e.g., soil, situation, etc., etc. He proceeds to show how export has risen from 40,000 cases of fruit in 1920 to 1,300,000 in 1930, and how careful packing has played its part. Lastly he deals with the extremely useful functions of the New Zealand Fruitgrowers Federation Ltd., founded in 1912, and of the New Zealand Fruit Export Control Board, which arose out of and in close co-operation with it in 1924. The latter controls the export of all fruit from New Zealand except that from the Province of Otago. It receives the fruit from the Federation which has previously received it from the grower, and has stacked, checked and held as circumstances demand. Figures given seem to substantiate his claim that the New Zealand grower is greatly benefited financially by his connection with the Board.

112. **Barker, B. T. P. and others.** 634.1/2.(072)

The national fruit and cider institute.

J. Bath and West., 1930-1931, 6th series, 5 : 128-204.

This short account of a year's work at the Long Ashton Institute is limited to : (a) a short review of general matters relating to the Institute and its associated centres at Berkeley Square, Bristol, and Campden, (b) a summary of the advisory work of those three centres, which constitute the Department of Agriculture and Horticulture of the University of Bristol, and (c) a few selected papers by individual members of the departmental staff, illustrating the range of the research investigations. The special papers are as follows :—Spraying trials against apple and pear scab at Long Ashton ; III. Season 1930—Progress report on vegetable diseases—Notes on the Beet Carrion beetle, *Blitophaga opaca*—A tomato pest, *Scutigerella immaculata*—A case of sainfoin midge, *Contarinia onobrychidis* Kieff, in Wiltshire—The control of Woolly Aphis on dormant nursery stock—Cider making trials for the 1929-30 season—The production of cricket bat timber.

113. **Hatfield, I.** 578.683

Control of moisture content of air and wood in fresh air chambers.

J. Agr. Res., 1931, 42 : 301-5, bibl. 8.

An account is given with illustration of an apparatus based on the principle governing that used by A. F. Heck for soil work. The author considers that the method described could safely be used not only for the study of the growth of wood-destroying fungi, but also, with certain adaptations, for spore or seed germination tests, the culture of small plants and other purposes.

114. **Jones, L. H.** **631.346**

Effect of the structure and moisture of plant containers on the temperature of their soil contents.

J. Agr. Res., 1931, **42** : 375-8.

Trials conducted with the following 3 in. pots : (1) ordinary clay flower pot, (2) glass tumbler (3) compressed peat, (4) leather fibre and unknown ingredients, (5) heavy paper infiltrated with paraffin. Pots porous enough to produce a moist outside surface kept a soil temperature lower than that of the air. Depending on the insulating value of their structure, non-porous containers maintained much higher temperatures than porous.

In the opinion of the author, given a uniform air temperature, the temperature of the soil in small containers depends on the porosity or insulating value of the material composing the container, while the porous pots are also influenced by the evaporating power of the air.

115. **Rogers, W. S.** **634.1/2:581.084.2:681**

Recording apparatus for horticultural experiments including automatic counting devices.

East Malling Res. Sta. Ann. Rept. for 1928, 1929, 1930, II. Supplement, 1931, **A14**, pp. 65-73, bibl. 3.

An account is given of various measuring, weighing and counting apparatus which, with the help of a field telephone, reduce work and chance of error in taking records of fruit experiments at East Malling. A specially useful account is given of secateurs which cut and record, picking bags which count, and a method of attaching a counter to the Cutler Apple Grader.

116. **Rudloff, C. F.** **575.257**

Pfropfbastarde. Sammelreferat. (Graft hybrids—a review.)

Züchter, 1931, **3** : 15-28, bibl. 51.

The author discusses the various results achieved to date and their usefulness. He considers that breeders for immunity may find help from graft hybridization. Thus the ideal grape vine for European purposes—which should incidentally be a direct producer—must, owing to the susceptibility of European varieties to *phylloxera*, be, in its essence of American, and in its 2-3 outer layers of European type. Such an outer layer should obviate "foxiness," as the coat of the berry would then be European. The problems studied in graft hybrid work are of the utmost importance to all who are studying rootstock influence in fruit trees.

117. **Schratz, E.** **631.588.2:631.544**

Einfluss künstlicher Beleuchtung auf höhere Pflanzen. Sammelreferat.

(The influence of artificial light on the higher plants—a review.)

Züchter, 1931, **3** : 45-57, bibl. 36.

The writer reviews important work done on this subject up-to-date, noting the varying effects with different plants, strength and duration of lighting tried. Experiments show that, though additional light beyond ordinary daylight has certainly a good influence on some plants, there is an optimum beyond which the giving of light may have harmful effects. Rootgrowth is considerably affected by additional light. Thus with dahlias short days lead to tuber formation and weak aerial growth, while extra light induces the formation of fibrous roots and strong vegetative growth of the aerial parts. As regards anatomical structure one of the more noticeable features is the greater thinness of the leaves subjected to artificial light. Among possible uses of artificial lighting are noted :—Quick ripening in summer, growth in winter, facilitation of selection work—since not only can one get more generations in a year by altering the flowering time of different varieties, but also crosses between late and early varieties are thus made possible—rapidity in seed testing, etc.

118. **Smith, F.** 631.588.2:631.544

Über die Lichtdurchlässigkeit verschiedener Glassorten. Einige vorläufige Ergebnisse. (The light transmissibility of different kinds of glass. Some preliminary results.)

Gartenbauwissenschaft, 1931, 4 : 521–52, bibl. 41.

The writer discusses tests with "ultraglass" and ordinary window glass. The different experimental sources of light are noted. The writer himself uses a mercury lamp and for measuring a quartz spectroscope and photoelectric apparatus. He notes qualitative and quantitative penetration. He concludes as regards horticultural use that, since the most important factor is penetrability, only plano-parallel glass should be used. As between "ultra" and ordinary window glass, since best quality window glass will transmit practically all wave lengths which occur even in winter, and wave lengths shorter than 0.300 are of almost negligible importance to the plant, there does not appear to be any great advantage gained by the use of "ultra" glass.

119. **Hutchins, A. S.** 635.1/6–1.589

The present status of mulch paper in vegetable production.

Minnesota Horticulturist, 1931, 59 : 15.

The writer summarizes results of experiments to date and concludes that, while paper mulching may be beneficial to warm season crops or crops under unfavourable conditions, there is under normal conditions of rainfall little benefit to be gained, while results may even be detrimental.

TREE FRUITS, DECIDUOUS.

(See also under STORAGE and PACKING.)

Selection.

120. **Sprenger, A. M.** 634.1/2–1.521

Selectie van Vruchtboomen. (Fruit-tree selection.)

De Fruitteelt, 1930, 20 : 1–9.

Not being satisfied of the uniformity of even well known varieties of apples and possessing only descriptions which were inexact or varied with each describer, the Dutch Pomological Society decided to make tests. Graft wood of certain well known varieties was obtained from leading nurserymen in 1922 and grafted on Type 2 Paradise stock. To neutralize any stock influence the grafted trees were planted out with the graft union 20 cm. under the soil, and two years later those which had put out roots above the union were cut off just above it and these rooted tops replanted. When the trees came into bearing a number of quite distinct types were found among Pomme de Coeur, Brabant Belleflower, and Gold Reinette, both as regards fertility and fruit characters and even in the habit of the trees. Owing to lack of adequate descriptions it is not possible to tell which, if any, are the true types. Variations undoubtedly exist and may have originated in various ways which are discussed. The fact remains that at present there is no guarantee that any particular tree will act up to its supposed varietal characteristics. It is suggested that the best types of current varieties should be singled out and propagated with a view to the gradual elimination of inferior types bearing the same name.

121. **Kosemanoff, S. I. and Chomentofsky, U.J.** 634.22–1.541.11

The *Insititia* plums of Mleev [Ukrainian-English summary].

Lenin Academy of Agr. Sci. Inst. for investigation of tree and small fruit culture, Bull. 2 : 1931, pp. 94, bibl. 77.

The results of observations on a large number of St. Julien seedling stocks. From a botanical standpoint it was possible to determine that while a few of the stocks closely resembled *Prunus spinosa* L. and probably represented forms of hybrids between *P. insititia* and *P. spinosa*, most of them were *P. insititia* L.

It was noted that "St. Julien" covers a multitude of forms and is very far from coming true from seed. From the pomological standpoint the authors divided the tested *Insittias* into 7 groups:—

1. *P. insittia* L. *P. spinosa* L. (?), 2. Acid-tart *Insittias*, 3. Vapid Is., 4. Oval, sweet Is. (St. Julien proper), 5. Rounded, sweet Is. (bullaces), 6. Oval, sour Is. (damsons), 7. Round, sour Is. (bullaces).

In all 56 forms are here determined and a description and key to determination given.

They found types typical of the wild tree showing the following characteristics:—Thorny branches, dwarf habit, pubescence of shoots, small fruits, dark colour, tartness of fruit, clinging stones, late ripening going hand in hand with poor yield, bad fruit-stone ratio, and also the reverse, i.e. absence of thorns, vigour, smoothness of one year shoots, large fruits, lighter colour, pleasanter tasting fruit, free stone, earlier ripening corresponding with a heavy yield and a favourable fruit-stone ratio. The suitability of different types for growing as fruit varieties, and as stocks for plums, apricots and peaches is considered.

Propagation.

122. **Dahl, C. G.** **631.458**

Ett försök att upphava jordtrötthet i plantskolor. (An attempt to eliminate soil sickness in nurseries.)

Sveriges Pomologiska Förenings Årsskrift, 1931, **32** : 45-47.

A preliminary communication on an experiment in progress at Alnarp, Sweden, to test the best means of restoring sick soil to its normal condition. Land which had previously grown fruit trees with great success but where now new plantings of budded rootstocks fail to thrive was selected. The ground was dug in the autumn, heavily dunged and laid out in duplicated plots 4 × 5.6m. The treatments given per sq. metre were (1) $\frac{1}{2}$ kilo commercial formalin strongly diluted with water, (2) carbon bisulphide 0.3 kg. poured into a hole in the ground, (3) sodium chlorate 40 gm, (4) chloride of lime 210 gm., the last two being dug into the soil, all applied in late autumn. In Spring, 1930, the apple rootstocks (E. Malling Type XIII) were planted on all plots. During the summer, the controls, sodium chlorate and chloride of lime plots made very poor growth, while the formalin plots grew away strongly, as did, though to a lesser degree, the carbon bisulphide plots. The stocks are now to be grafted and will remain under observation. Judged by the shoots cut off from the rootstocks prior to grafting the growth of the formalin plot was definitely greater than that on any of the other plots. Large scale experiments are now being conducted on other land at Alnarp.

123. **Nielson, J. A.** **631.543:665.412**

Reducing the mortality of new plantings.

Fruits and Gardens, 1931, **47** : 2 : 3, 10.

In the case of deciduous woody subjects only the method advocated is that of dipping the above ground portion of the tree in liquid paraffin wax at a temperature of 160° up to but not exceeding 180°F. immediately after lifting. Such treatment, it is claimed, prevents desiccation and the growth of moulds, and does not hinder respiration.

124. **Hillenmeyer, W. W.** **634.5-1.543**

Recent advances in all-summer planting.

American Nurseryman, 1931, **53** : 54-5

American nurserymen are endeavouring to develop a technique whereby plants and shrubs can be lifted and supplied to their customers in full growth without appreciable check or loss.

Method I. The plant is lifted with a large ball of soil, which is immediately securely wrapped in strong canvas or sacking. The best time is early in the morning when the stems and leaves are full of moisture. After digging the leaf pores will close and check transpiration. The planting holes should be already dug in moisture-retaining soil, made up if necessary with peat or humus. The holes should be half full of loose soil thoroughly saturated with water. The

plants when dug are covered with sacking and the tops are kept tied in to diminish transpiration. The sacking is kept moist for from three to seven days, after which the covering may be removed. This method is suitable for plants which are to be moved only a short distance. Method II is more suitable for dry districts, or where plants have to travel. The plant is dug as before but placed subsequently in a storage cellar or slat house on a concrete floor. If several plants are being moved they are placed close together, the canvas containing the soil and roots kept moist, and the foliage constantly sprinkled. Frequently peat or tow is packed round the base of the plants, as this generates some heat and helps to start root action. In a few days the plants will have ceased to wilt, and they can then be safely transported to their destination, subsequent treatment being as outlined in Method I.

Rootstocks.*

125. **Hatton, R. G.** 634.1/2-1.541.11
The elimination of sources of error in field experiments. The standardization of fruit tree stocks.
East Malling Res. Sta. Ann. Rept. for 1928, 1929, 1930, II. Supplement, 1931, A14, pp. 13-21, bibl. 12.

The author considers that the variability in behaviour of even similarly treated individuals of a single variety, which formerly vitiated field experiments with fruit trees, can now be eliminated by modern methods of plot lay out and by the use of vegetatively raised rootstocks. He points to proved instances at East Malling, where it has not only been possible to show responses of quite young trees to fertilizers, but also to show the different response of a single variety when grafted upon different *known* rootstocks. He concludes that the "build up" of the tree should be the first fundamental consideration both of the investigator and the grower.

126. **Swarbrick, T.** 634.11-1.541.5
The influence of the position of the top bud of the scion upon the stand of grafts.
Long Ashton Ann. Rept. for 1930, 1931, pp. 46-51, bibl. 1.

The writer's material consisted of some 1,200 miscellaneous French seedlings grafted in 1930 with Bramley's Seedling and White Alphington. The cuts were made so that the top buds occupied one of two positions: (a) in line with matched tongues of the stock and scion, and (b) in line with the mismatched tongues of the stock and scion, these two positions being Roberts' "Best" and "Worst" positions respectively. Statistical examination of data leads the author to the following conclusions: The results are got from trees where miscellaneous seedlings served as rootstocks, in view of which the general uniformity is interesting. These preliminary observations show that the advantage always lies with the bud-in-line position. With White Alphington there are less small trees, 8 per cent. as against 24 per cent. and more large trees 75 per cent. as against 60 per cent. The stand of grafts was not here affected by the position of the top bud of the scion. With Bramley's Seedling the stand of grafts was much better in the case of bud-in-line grafts, 84 per cent. as against 75 per cent. The effect upon tree uniformity, though noticeable, was not so marked as with White Alphington. It would appear that under ordinary conditions it will be advantageous to make grafts with the top bud in line with the matched cambium of the tongues of the stock and scion.

127. **Spinks, G. T.** 634.11-1.541.11
Apple root stock investigations.
Long Ashton Ann. Rept. for 1930, 1931, pp. 19-26.

This is an account of trials of selected, vegetatively reproduced seedling stocks planted out in different districts, worked with such commercial varieties as Worcester Pearmain and compared with trees on Malling Types II or XII as a standard. The lifting of trees from the nursery has shown that the original classification of these new selections (see *L. A. Rept. for 1917*) according

* See also 173, 174, 185.

to fineness and coarseness of roots no longer holds good, and it seems that the original classification was based on the type of root system produced as the result of the plants being dug up and replanted a year or two before examination. As one example only, one stock formerly classed in class D for its root system has fairly consistently produced roots which would now be classified as F. The range of differences in types of root-system on trees of ages between 2 and 5 is not so great as that originally found on the young seedlings. None of the stocks appear to have a dwarfing effect comparable to that induced by Type IX. Several seem to be approximately equal in vigour to Type II. Differences due to rootstock are noted in habit of growth of scion, as also stock effect on colour of fruit. No clear correlation has been found between root type and tree performance. It has not yet been possible to select any of the stocks as decidedly superior or inferior.

128. **Shaw, J. K.**

634.11-1.541.11

Dwarfing stocks for apples.

National Nurseryman, 1931, 39 : 3 : 14.

A very brief account of trials by the pomological department of the Massachusetts Experiment Station of the so-called Malling apple stocks 1-16 except 7, 11 and 14. The results are, in general, similar to those got with the same stocks in England worked with English varieties. It is noted that McIntosh grew well on No. 1, whereas Wealthy was much dwarfed. The author remarks that the stocks can be propagated by mound layers and will grow readily from root cuttings taken from one or possibly two year roots, but that older roots do not grow so well. He notes that greater uniformity is assured by the use of these vegetatively reproduced stocks and considers that in cases where even their slight superiority is shown, the increased cost, which would be an insignificant item in the total cost of establishing an orchard, would be amply repaid by results.

129. **Johnston, S.**

634.13-1.541.11

Some observations on pear stocks.

Fruits and Gardens, 1931, 46 : 12 : 5.

With a view to finding a pear stock that unlike the French pear seedlings in common use in America would not sucker and would be more resistant to pear blight, three pear species, *Pyrus calleryana*, *P. ussuriensis* and *P. serotina* were introduced and have since been widely tested as pear stocks. Seedlings of *P. calleryana* have shown great variability in vigour, so much so that it is suggested that the seed may have been mixed. It is subject to winter injury in northern districts. *P. ussuriensis* is also variable and the Chinese source of seed is unreliable. It is not subject to winter injury. Trees grown on *P. serotina* have produced fruit showing black-end, a physiological breakdown causing the calyx end of the pear to turn black. The pears on this stock are also subject to mushroom rot, a disease attacking the root system. Trees budded on French pear seedlings grown as controls have made perfect unions, vigorous and uniform growth. In spite of the tendency to sucker and susceptibility to pear blight the French seedling stock would at present still appear to be the most suitable for pears in Michigan and places of like climate.

130. **Upshall, W. H.**

634.23-1.541.11

An easy means of distinguishing the roots of Mazzard and Mahaleb.

Proc. Amer. Soc. Hort. Sci., 1930, 27 : 87, bibl. 2.

If the outer layers are sliced off exposing the inner bark, the cut surface of Mazzard will be in a few minutes xanthine orange and that of Mahaleb cinnamon. Later the Mazzard colour deepens to burnt sienna, while Mahaleb does not alter. (Colours from Ridgeways Colour Standards and Nomenclature.) This forms a ready means of identification for practical growers. Mazzard also has more fibrous roots, and roots of one or two years have a distinct trace of brown in their surface colour not shown by Mahaleb. A water extract of dried root bark treated with ferric chloride, as recommended by Halma and Haas in citrus stock identification, turns almost black in the case of Mazzard but remains almost unchanged in that of Mahaleb.

131. **Witt, A. W. and Garner, R. J.** 634.25-1.541.11
Peach stock trials. A progress report.
East Malling Res. Sta. Ann. Rept. for 1928, 1929, 1930, II. Supplement, 1931,
A14, pp. 22-31, bibl. 5.

A report on trials since 1921 of Hale's Early peach, both in pots under glass and in the open, on a wide range of stocks all mentioned by Hatton in the *Journal of Pomology and Horticultural Science*, 1921, 2 : 209-45. Incompatibility was noted both in nursery and afterwards. Two distinct groups are apparent, the outstanding vigorous trees being those on Brompton and Common Mussel; Pershore and Kroosjespruim forming more dwarfing trees. Differences in vigour are seen between trees on vegetative races from different seedlings of the same variety. Under glass trees on Brompton produced much the heaviest crops, while those on Kroosjespruim produced consistently poor ones.

132. **Vyvyan, M. C.** 634.11-1.541.11:581.143
Course of growth in an apple stock during the maiden year.
East Malling Res. Sta. Ann. Rept. for 1928, 1929, 1930, II. Supplement, 1931,
A14, pp. 85-97.

The course of growth and its distribution between roots, leaves and stems was followed in the unworked Malling No. XIII stock for two seasons. The total weight, including leaves, more than doubled between April and October. The increases were approximately proportional to weights at planting, whether trees were large or small, pruned or unpruned before planting. The rate of increase in leaf weight decreased progressively during summer. The times of fastest growth of roots varied, apparently with weather conditions. The dry weight of roots formed before November was greater than that of the leaves. Data afforded in the spring of 1931 confirmed the conclusion drawn from the first two years that the weight of roots and other organs do not increase during the winter months. Active new root formation was observed at time of bud break.

133. **Roach, W. A.** 634.11-1.541.11/12:581.133
The chemistry of the rootstock-scion effect. I. The elements absorbed from the soil. A progress report.
East Malling Res. Sta. Ann. Rept. for 1928, 1929, 1930, II. Supplement, 1931,
A14, pp. 101-4, bibl. 1.

Spectrographic examination of the ashes of various parts of two-year budded Lane's Prince Albert apple trees, worked on Malling rootstocks IX and XII has revealed the presence of : K, Ca, Mg, Na, P, Fe, Al, Mn, Ba, Sr, Li, Cu, Pb, Ti, V, Si, Ni, Cr, Sn, Mo, Ag. Most of these were distributed throughout the whole plant. Lead was restricted to the roots. Molybdenum occurred only in the root and rootstock of trees on IX up to the bud union and nowhere in the scion. This element was absent from all parts of trees on stock XII. The author claims no finality for any of these results, but considers they at least suggest that through its roots a rootstock may exert selective action in absorbing elements from the soil, and that one rootstock may differ from another in the way it exerts this action.

134. **Roach, W. A.** 634.11-1.541.11:581.084.1:581.11
The chemistry of the rootstock-scion effect. II. Methods for testing the effects of substances in solution on fruit trees. A progress report.
East Malling Res. Sta. Ann. Rept. for 1928, 1929, 1930, II. Supplement, 1931,
A14, pp. 105-110, bibl. 4.

This gives a short account of various methods tested for inducing apple trees to take up solutions through cut surfaces. The "trail" of toxic concentrations of substances was marked by damaged tissues. Stocks taken straight from the stool readily absorbed solutions into every part when hung inverted with their cut ends connected to tubes containing the solution. Bedded root stocks could be treated similarly. Absorption through a side branch of a rootstock led to more general distribution throughout the plant when it was lifted, than when it was growing normally.

Growth, Nutrition, etc.

135. **Kvarazkhelia, T.** 634.1/7:581.144.2
 Beiträge zur Biologie des Wurzelsystems der Obstbäume. (The biology of
 the root system of fruit trees.)
Gartenbauwissenschaft, 1931, 4 : 239-341.

This article, which appeared first in Russian in 1927 as a bulletin of the Abkhasian Experiment Station of Sukhoum (see H.A. I, No. 67), here appears with much improved illustrations in German. The author's very keen observations, mainly of particular instances or of the data afforded by very simple experiments in various Southern territories of the U.S.S.R. and in Turkish Kurdistan and Georgia, carried out mainly on trees worked on seedling stocks, led him to numerous extremely interesting, if not entirely proved, conclusions. The main points in his summary are as follows :

1. The roots spread always exceeds that of the branches except in cases of mechanical obstruction to the roots. The sum total of roots depends on soil conditions.
2. Environment is all-powerful. Soil and subsoil are of the utmost importance and may entirely counteract the individual peculiarities of different fruit varieties. The roots react particularly strongly to such soil features as aeration, moisture, nutrient content, temperature, etc. Soil aeration has tremendous influence and where it is poor the roots tend to grow nearer the surface. Different fruit varieties are, however, susceptible in varying degrees. Other things being equal, where soil humidity is deficient, the roots will grow in the direction of greatest humidity. The drier the soil, the greater the root system. The greater the moisture supply, the smaller will be the area occupied by the roots, provided sufficient nutrients are present. The poorer the soil in nutrients, the further out will the roots grow. Soil nutrient content is the most important influence on root development in podsol and similar damp soils. Soil temperature is of varying importance with various fruit varieties.
3. Varieties should not be divided into deep and shallow rooters. The roots of one and the same variety of fruit trees will be deep or shallow rooted according to soil consistency.
4. The adaptability of roots to their environment depends on the type of subsoil and on the water balance of the soil. The root system of particular varieties shows great plasticity.
5. Rostmistrov's "Root Coefficient" method is not applicable when dealing with fruit trees.
6. Steglich's theory on foodstuff replenishment is also inapplicable, as a fruit tree's roots break new ground each year.
7. Roots grow out far beyond the spread of branching and hence need manuring accordingly.
8. The habit of the root system is not influenced by variety.
9. Deep planting is harmful in impermeable and pointless on light soils. The soil should be worked to a depth of 20-50 cm. (8-20 in.) according to its consistency. It is essential not to work deeply or bring the subsoil to the surface, where this consists of heavy clay. Deep working is only justifiable on stony, rocky ground. Only by shallow working can harm to the actively absorbing roots be avoided. Working only just around each tree is quite useless owing to the wide spread of the roots.
10. The aim in manuring an old orchard should be equal distribution through the whole upper surface of the soil.
11. Spacing should not be made to depend on the top growth, but conditions and the root system development, which so largely depends on these, should be of primary importance.
12. The whole question of irrigation needs reinvestigation. Excessive irrigation prevents aeration of the roots, which induces growth of surface roots, and these are damaged by normal periodic working of the soil.

136. **Heinicke, A. J. and Batjer, L.P.** 634.11-1.4
 Difference in soil and tree growth within limited areas.
Proc. Amer. Soc. Hort. Sci., 1930, 27 : 69-74, bibl. 4.

Shows how subsoil conditions markedly affect fruit tree growth. A diagram shows the effect on the growth of a row of apple trees growing in a uniform surface soil of friable loam of variations in the subsoil, which changes from (1) sandy loam over compact clay, to (2) compact clay, and (3) sandy clay over loose silt and sand. The trees growing over No. 3 subsoil are markedly superior to those over No. 2, many of which made very poor growth or died. No. 1 subsoil produced a growth inferior to 3 but superior to 2. From this it is argued that since abrupt changes in subsoil may quite easily occur in experimental plots and invalidate the experiment,

no long range fruit growing experiments should be laid down until the uniform nature of the subsoil has been determined. This in the writer's opinion can only be done satisfactorily at present by actually growing test trees on the proposed experimental ground, a process occupying several years.

137. **Barss, A. F.**

634.13-1.432.2:581.14

Effect of moisture supply on development of *Pyrus communis*. (Contributions from the Hull Botanical Laboratory 406).

Bot. Gaz., 1930, 90: 151-76, bibl. 21.

The experiment took place on 48 dwarf pears in pots, which were divided into 4 lots and treated uniformly except for watering. When the total water given was the same, the frequency of watering had no apparent effect. The number of flowers to each cluster averaged less when abundant water was given, as compared with less heavily watered trees. Abscission was more pronounced where least water was available. After a small crop of fruit moderate watering was associated with production of normal fruit. After a large crop moderate watering was associated with production of much smaller and poorer quality fruit than was abundant watering. The value of thinning to get increased size in case of water shortage is stressed. Abundance of water was accompanied by increase in vegetative growth and in length of growing season. There appeared to be a close qualitative and quantitative relationship between shoot growth and fruit development, regardless of water received. Detailed histological study showed the most pronounced difference in gross topography of tissues to be in the extent of the xylem area. As between a large, medium and small amount of water this stands in the proportion of 15 to 2 to 1 respectively. The cortex is largest in the moderately watered lot. The data suggest that following changes in water supply alteration in the metabolic processes may be due to physical or nutritional causes or both. Stress is laid on the relation which the physical condition of the soil and the supply of available nutrients may bear to water requirement in securing its greatest practical efficiency.

Pollination.

138. **Riabov, J. N.**

634.1/2:581.162.3

The problems of pollination and fertilization of fruit trees. [Russian-English summary.]

J. Bot. Garden, Nikita, Yalta, Crimea, 1930, 14: 1-259, bibl. 784.

A most comprehensive survey of the literature on the pollination of fruit trees containing nearly 800 references. The author discusses the work already done by workers engaged in research on this subject and presents his own conclusions, which he states may now be regarded as sufficiently established. While it is true that most of these conclusions do conform to what is already accepted, a particularly interesting section stresses the possible influence of environment and of the internal conditions obtaining in the plant. For example the author holds that self-fertility and self-sterility are dependent partly at least on environment, and uses this theory to account for the contradictory results obtained by certain investigators. He claims in fact that environment can so alter the genotypical properties as to render a variety sterile to either self or cross pollination, and that could the influences be removed the former varietal properties would be restored. Another conclusion to which he comes is that the degree of germination of pollen in artificial media has no direct connection with the percentage of fruits set under natural conditions. Discussing metaxenia, or the influence of the pollen of the paternal variety on the fruits of the mother plant, he suggests that upholders of this theory have not taken into consideration a series of coexisting conditions, which might equally have induced the changes ascribed by them to pollen influence. In the course of the paper the self-sterility or otherwise of apples, pears, cherries, peaches and almonds is dealt with in turn, and it may be interesting to note that the author has grouped plums as follows. (a) Varieties of *Prunus salicina* usually self-fertile. (b) Varieties of *P. americana* either self-sterile or self-fertile with a tendency to self-sterility. (c) Varieties of *P. domestica* either self-fertile or self-sterile. (d) Varieties of *P. insititia* self-fertile.

139. **Johansson, E.** 634.1/2:581.162.3
 Blombiologiska försök med fruktträd vid Alnarp, 1926-30. (Pollination experiments in fruit trees at Alnarp, 1926-30.) [English summary.]
Contribution Swedish Permanent Committee Orchard Research, No. 23, 1931, pp. 37, bibl. 22.

The work here described was in continuation of that described in Contribution No. 7 of 1926. The results of cross and self pollination experiments with 2 apricots and numerous varieties of pears, apples, plums and cherries are tabulated. Among cherries Rivers Early is noted as a good pollenizer. In plums no indication of cross-incompatibility was found. Victoria was found to be a good pollenizer as also Greengage and Hackman. Belle Lucrative (Seigneur d'Esperen, of the pears is recommended in that capacity, as also Nouveau Poiteau. No case of pear cross-incompatibility was noticed. The experiments support the opinion that cross-incompatibility is rare in apples. The Danish apple Filipa was found a successful pollenizer as also—late flowering varieties—Cox's Pomona. The belief that arose in earlier experiments that the number of viable seeds is generally lower in fruits arising from self pollination than in those got by crossing was confirmed.

140. **Branscheidt, P.** 634.1/2:581.162.3
 Weitere Mitteilungen über die Befruchtungsverhältnisse beim Obst, insbesondere bei Kirschen. (Further notes on fruit tree pollination, especially of cherries.)
Gartenbauwissenschaft, 1931, 4 : 387-427, bibl. 25.

Among his conclusions are the following : The germination capacity of pollen and the growth capacity of the pollen cannot be explained as traceable to purely osmotic causes. An all important rôle is played here by substances of highly complex chemical composition, highly surface-active substances, primarily water soluble phosphatides and ferments, which are contained both in the stigma or glands of the conducting tissue of the style and the pollen glands, and largely determine the physical peculiarities of the germination milieu. Mere pollen germination tests do not give in the case of stone fruits a clear picture of the relation between germination and fertilization capacity of a pollen for various other fruit trees which need to be pollenized. The relative strength of interfertility among different stone fruits can only be gauged by practical crossing experiments or by the so-called "Crossing cultures"—stigma pollen. The accuracy of results from this kind of experiment exactly performed has been proved in Germany and elsewhere. Most of the cherries tried in the Palatinate were found to be self-sterile. Self-fertility occurs sometimes under favourable conditions among late flowering varieties. The existence of two inter-sterile groups was established. For the production of a good crop it is not immaterial which type of inter-fertile cherries are available. "Cellophan" was found less satisfactory for bagging than "Pergamin."

141. **MacDaniels, L. H.** 634.11:581.162.3
 The possibilities of hand pollination in the orchard on a commercial scale.
Proc. Amer. Soc. Hort. Sci., 1930, 27 : 370-3.

Hand pollination of apples when the weather is unfavourable for natural cross pollination gives very successful results. Blossoms should be picked just before opening, the unopened anthers pulled off and spread on paper trays in a warm room to dry ; the pollen is then placed in small unstoppered bottles and applied to the trees with a camel's hair brush as soon as possible. On a heavy blossoming tree it would only be necessary to pollinate 20 to 25 per cent. of the blossoming spurs to get a full crop, nor should all the flowers in a cluster be treated. With experience a tree 15 years old capable of bearing 10-15 bushels can be pollinated in an hour and a half. Another method is to cut branches of a good pollinating variety when pollen is being shed and to brush the mother trees with these.

142. **Hopfinger, J. C.** 634.11:581.162.3

Controlled pollenization of the apple.

Better Fruit, 1931, 25 : 9 : 9-10.

The difficulty of obtaining pollenization of Delicious apples planted alone has been successfully overcome by the introduction of bunches of Jonathan apple blossom hung in buckets on the Delicious trees and of a hive of bees per acre. The bees will always be essential to adequate pollenization, while the Jonathan blossom bunches are only necessary until top grafting about one tree in six with Jonathan, Winter Banana or other suitable pollinizer has taken their place.

143. **Overholser, E. L. and Overley, F. L.** 634.23:581.162.3

Cherry pollination studies in Washington, 1930.

Proc. Amer. Soc. Hort. Sci., 1930, 27 : 400-403, bibl. 4.

An account of experiments carried out in North Central Washington to discover an effective pollinizer for the inter-sterile cherries, Bing, Napoleon, and Lambert. It was found that Deacon was one of the most satisfactory for Bing and Lambert, and reasonably good for Napoleon. Other pollinizers in the case of Lambert and Napoleon gave a slightly higher percentage of set, but Deacon results were adequate for commercial purposes and this cherry had the merit of selling within 2 cents per pound of the price made by Bing. In the reverse direction the pollen response of Deacon (self-sterile) to Bing, Lambert, and Napoleon was satisfactory, though considerably below the normal count for open pollination.

144. **Minderhoud, A.** 638.12:581.162.3

Untersuchungen über das Betragen der Honigbiene als Blütenbestäuberin

(Test on the behaviour of the honey bee as a pollen distributor.)

Gartenbauwissenschaft, 1931, 4 : 342-62.

The writer first discusses the results of other research workers and then details his own experiments with marked bees on the flowers of *Taraxacum officinale*, *Trifolium sp.*, *Cruciferae sp.*, *Reseda*. He considers that his data warrant the following conclusions: In visiting low growing plants and in the absence of a strong wind the honey bee will for a long time visit one particular place, the area of which does not ordinarily exceed 10×10 metres. Under such circumstances its successive visits are to flowers not further apart generally than one metre. He concludes that one can only expect to get full benefit from bees when different pollens are available to them within a small radius.

*Manuring.*145. **Hopkins, E. F. and Gourley, J. H.** 634.11-1.84

The effect of nitrate applications on the soluble carbohydrate in apples.

Proc. Amer. Soc. Hort. Sci., 1930, 27 : 32-6, bibl. 1.

Previous work had proved that with nitrate fertilization of apple trees the total nitrogen of the flesh of the fruit is increased by 50-150 per cent., depending on the amount of nitrogen supplied and whether the trees were in cultivation or under grass. In the latter case increases were greater. There was also shown a notable proportionate increase in catalase activity of fruit from the treated plots. No difference in keeping quality as indicated by internal breakdown was apparent. This paper describes further investigations, and states that contrary to expectations the amounts of soluble carbohydrates do not show much difference between the treated plots and the controls, and that it must be considered at present that the application of nitrates has little effect on the soluble carbohydrate content of apples.

146. **Plagge, H. H.** 634.11-1.84

Do successive applications of nitrogenous fertilizers influence the development of physiological disorders of apples in cold storage?

Proc. Amer. Soc. Hort. Sci., 1930, **27** : 23-7, bibl. 10.

The experiments were made on trees in a well managed commercial orchard in Central Iowa situated on the Southern Iowa loess area. The writer concludes that single and successive annual applications of sodium nitrate to mature Jonathan and Grimes Apple trees appear to have increased the susceptibility of the fruit to soggy breakdown—a low temperature breakdown occurring in cold storage—up to the second annual application only. The third annual application of nitrate soda resulted in a slight decrease in breakdown, but seems still to keep the breakdown susceptibility at a high level as compared with that of untreated fruit. Soggy breakdown in Jonathans is found to decrease strikingly the longer the interval between picking and placing in cold storage at 30°F; with Grimes the reverse is the case and susceptibility increases in proportion to the number of days delay at 50°F. With Jonathans storage at 36° effectually prevented breakdown regardless of fertilizer or storage treatment.

147. **Knowlton, H. E. and Hoffman, M. B.** 634.11-1.84

Nitrogen fertilization and the keeping quality of apples.

Proc. Amer. Soc. Hort. Sci., 1930, **27** : 28-31, bibl. 7.

The tests were carried out on 20 year old trees of Black Twig, Stayman and Grimes in 1928 and 1929. The soil is a limestone of good fertility. The trees were divided into units of 10 trees of each sort, and the fertilizer was applied three weeks before bloom in the following proportions. Block unit A. No fertilizer, B. 5 lbs. nitrate of soda, C. 10 lbs. nitrate of soda. At harvest one bushel of average fruits from each tree was placed in cold storage. In Stayman and Black Twig the no fertilizer apples were firmer (by pressure tester) than those from the nitrated trees. The fruit from the 10 lb. nitrate trees was the softest. In Grimes the results were conflicting. As regards keeping quality however there seemed to be little difference between fruit from the fertilized and the control trees. The poor reputation of apples from heavily nitrated trees is due to (1) scalding badly in storage owing to poor colour, (2) fruit being left on the trees till over ripe in order to get better storage colour, (3) poorly coloured fruit being lower in dessert quality than well coloured fruit. The studies proved the impossibility of fixing arbitrarily a definite pressure test in pounds, which a given variety should test at picking time. While lack of rainfall tends to produce smaller fruit with a higher pressure test, it is believed that the type of cellular structure produced under different conditions is the causal factor.

148. **Ruth, W. A.** 634.1/2-1.84

The limits of nitrogen fertilization.

Trans. Illinois Hort. Soc., 1930, **64** : 549-54.

The richer the soil, the slower is the tree to mature, other things being equal; the young tree moreover forms new wood later in the season than the old tree. Hence, since it is desirable that all wood should be ripe when winter starts, one should be able to fertilize a tree on a poor soil more heavily than one on a rich soil and an old tree more heavily, in proportion to its size, than a young tree. The best times for application are the spring before growth starts and the fall or late summer, after active growth has stopped.

149. **Pilling, M. and Pearsall, W. H.** 664.85.11:581.192:631.8

Preliminary observations on the nitrogenous materials in apples during storage.

Long Ashton Ann. Rept. for 1930, 1931, pp. 62-70, bibl. 9.

The apples used were Bramley's Seedlings, some from trees receiving abundant potash, some from potash starved trees. Of these some of each type were stored at 1°C., others at 5°-15°C. In addition Newton Wonder apples from trees receiving high and low nitrogen manuring were stored at 1°C. An account is given of sampling methods and determination of N in different forms. The authors conclude that decided changes in Protein N and Rest N occur during storage, and these changes seem to show a general parallel with the development of breakdown,

as well as with differences in storage conditions and in internal conditions induced by previous manurial treatment. Before generalizing on these apparent relationships, further work is needed. It seems clear, however, that protein degradation is progressive during storage life and that it may be more rapid at 1°C. than at ordinary storage temperatures.

Cultural Practices.

150. **Thomas, P. H.** **634.1/2-1.542**

Pruning deciduous fruit trees.

Tasmania Dept. Agr. Bull. 5, 1930, pp. 25.

The writer notes the general principles which should guide the pruner of fruit trees and then proceeds with very clear illustrations to show how best to prune the varieties of fruit trees grown in Tasmania in accordance with the exigencies of their particular growth habits and environment. He deals in turn with apples, apricots, peaches and nectarines, pears, plums and cherries.

151. **Painter, A. C.** **634.22-1.542.27**

An experiment in the thinning of Victoria plums.

East Malling Res. Sta. Ann. Rept. for 1928, 1929, 1930, II. Supplement, 1931,

A.14, pp. 74-82.

Description from an economic standpoint of thinning in a year of heavy set. Thinning consisted in the removal of approximately 3 out of every 5 plums on 15 trees, while the control consisted of 15 trees left unthinned. Thinning resulted in larger fruit and a higher net return for the fruit in spite of a much lower aggregate yield. Against the labour spent in thinning could be set a saving of both time and labour in packing and marketing. Wind damage, almost negligible on the thinned trees, was considerable on the unthinned.

152. **Thomas, P. H.** **634.1/2-1.541.44**

Converting the unprofitable fruit tree.

Tasmanian J. Agr., 1930, 1: 198-202.

An account of a method of topworking as recommended in Tasmania. In winter the selected trees are thoroughly stripped of all laterals, fruit spurs, etc., only the skeleton framework remaining. Large wounds so caused are coated with a fungicidal paint, such as white zinc and linseed oil, or with coal tar. In the following spring the trees will force out many new growths throughout the length of the main limbs. These are thinned out when soft and immature, a well placed growth at the terminal being retained for the leader, while those on the main limbs are spaced about 8 inches apart. Budding is started as soon as the new growths are mature enough to allow the insertion of the buds. The object is to place these as near to the main limbs as possible, choosing their positions to suit future growth. The budded shoots should be headed back just before growth begins early in the spring. When the buds of the new variety start to grow, all other shoots should be suppressed, and they themselves should be lightly tipped when about 14 inches long. This has the effect of maturing the wood. In subsequent pruning a lateral bearing system should be encouraged when possible. This method is considered by the author to be particularly suitable for deciduous fruit trees which do not respond well to graftage, and are liable to the attacks of *Polystictus versicolor*.

153. **Wallace, T., Charley, V. L. S. and Jones, J. O.** **634.11-1.542.24**

Some effects of bark ringing on the composition of fruit trees.

Long Ashton Ann. Rept. for 1930, 1931, pp. 52-61, bibl. 2.

This is an account of chemical investigations carried out in connection with an experiment on bark ringing Bramley's Seedling apple. The trees were ringed, some in May, 1928, others in May, 1929, and others not at all. Analysis of shoot samples taken in July, 1929, and of fruit in October, 1929, showed that: The residual effects of 1928 ringing were negligible except as regards total nitrogen content of fruits. The 1929 ringing method resulted in high dry matter, low total nitrogen and low total ash (except in wood in one case) in fresh weight in all parts of

the shoot, ash constituents especially CaO being also generally low in these cases. These treatments were also associated with relatively low proportions of CaO and high proportions of K₂O in the ash of the leaves. In the fruits, dry matter, sucrose and total sugars were high, and total nitrogen low; acidity, total ash and proportions of ash constituents were not significantly affected.

154. **Bradford, F. C.**

631.542.24

Ringling to induce fruitfulness.

Fruits and Gardens, 1931, 47 : 1 : 3, 11.

Opening with a short note on the antiquity of the practice of ringing the author proceeds to discuss the objections usually raised against the practice. He concludes with the statement that, while ringing accomplishes its purpose of inducing fruitfulness, the following questions remain unanswered. Will it induce continuous as well as early cropping? Will the precocious crop so exhaust the tree's reserves, so depress its growth, that it will fail to bear for several succeeding years, or bear only mediocre crops? Can nitrogen carrying fertilizer push ringed trees along in spite of the crop drag? What will the balance sheet show in the orchard's later years as between ringed and unringed trees?

Plant Protection.

155. **Harvey, R. B.**

632.6:632.9

Sprays for the protection of trees against sunscald and rodent injury.

Proc. Amer. Soc. Hort. Sci., 1930, 27 : 548-9.

In a trial of various materials sulphonated linseed oil was found to give almost complete immunity from rabbit and field mouse attack. Any trees attacked merely had single bites on the side of the tree where the spray was thinnest and the tree did not suffer. Sulphonated oil can be combined with copper soap to act as an additional fungicide. Strychnine and other lethal substances can be dissolved in the oil to kill the rabbits if they are starved into eating the protected bark. Sulphonated oil unlike other materials is not washed off by heavy rain. Titanic white paint diluted with turpentine and applied to the south exposure of the limbs of the tree protects in winter against sunscald and in summer against high temperatures. Treatments which proved ineffective against rabbits were aluminium and bronze paints, copper soap dissolved in linseed oil, rubber dissolved in linseed oil, concentrated lime sulphur solution, beef-liver blood.

156. **Kelley, V. W.**

632.951.8:581.12:634.11

Effect of certain hydrocarbon oils on respiration of foliage and dormant twigs of the apple.

Univ. Illinois Agr. Exp. Sta., Bull. 348, 1930, pp. 371-406, bibl. 24.

Oils of different viscosities and degrees of unsaturation were tested in their effect upon the respiration of dormant twigs and foliage of the apple. During the dormant season, i.e. before the separation of the bud scales, all oils accelerated respiration; when applied immediately after this stage, but before the first leaves had opened (delayed dormancy) they retarded respiration. The buds of cuttings, treated with any of the oils during the dormant season, failed to grow, but treated during delayed dormancy were only retarded in their growth. The light oils, however, had very little effect. Viscosity was important in respiration during the dormant season only with saturated oils; at delayed dormancy it was a factor with both saturated and unsaturated oils. Younger leaves were more easily injured than older leaves. The relative humidity during and following the application of oil sprays is an important factor to be considered in avoiding injury, the greatest injury being always produced at high humidity. Oil injury was produced on foliage only when the spray was applied to the under side at high relative humidity, the severity of the injury depending on age of leaf and length of exposure to high humidity. Microscopic examination showed that oils penetrated the leaf through the stomata soon after application. High humidity is thought to facilitate the entrance of the emulsion. The practice of spraying with oil for its physiological effect on the tree should not in view of these experiments be encouraged.

157. **Martin, J. T. and Tattersfield, F.** 632.951.1
The evaluation of Pyrethrum flowers (*Chrysanthemum cinerariaefolium*).
J. Agr. Sci., 1931, 21 : 115-35, bibl. 7.

The increasing interest in the possibility of extending the use of Pyrethrum as an insecticide has caused the authors to examine the different analytical methods hitherto used for determining the pyrethrins in pyrethrum flowers. They suggest certain modifications in technique. They have obtained good concordance between analytical data and insecticidal tests using *Aphis rumicis*. A new method for the quick approximate evaluation of unadulterated samples, using small quantities of material, is given. Observations on the pyrethrin content of individual flowers in the various stages of development are recorded, making use of a modification of this method.

158. **Staniland, L. N. and Walton, C.L.** 634.11-2.753
A note on the control of Woolly Aphis on dormant nursery stock.
J. Bath and West., 1930-1931, 6th series, 5 : 181-3.

The experiments took place on 48 bush and 48 standard apples, there being 1 control and 5 treatments: 1. HCN gas (1 oz. sodium cyanide per 100 cu. ft. for 1 hour). 2. 10 per cent. tar oil wash (old type wash as used prior to introduction of modern neutral high-boiling type). Dipped. 3. 10 per cent. tar oil wash. Sprayed. 4. Nicotine and soft soap spray (8 oz. per 100 gallons). Dipped. 5. Nicotine and soft soap. Sprayed.

It would appear from data obtained that infestations on young apple trees may be eradicated by immersion for 10 minutes in a 10 per cent. solution of tar oil wash or by spraying thoroughly with it. HCN treatment was quite successful, while nicotine and soft soap only partially succeeded.

159. **Mumford, E. P.** 631.521.6
Studies in certain factors affecting the resistance of plants to insect pests.
Science, 1931, 73 : 49-50, bibl. 15.

Resistance to insect pests may be due to (1) some external protective agency such as thickened epidermis or cuticle, the development of hairs, etc., thus American Upland cotton, *Gossypium hirsutum*, can owing to the hairs which cover it resist jassid attacks, against which Sea Island and Egyptian cottons are helpless, (2) some condition of the cell sap which repels insects, such as the presence of certain oils, acids, etc., e.g. a high ratio of potash to phosphoric acid in the leaves of the tea plant, *Thea sinensis*, is said to increase its resistance to the attacks of the tea mosquito, *Helopeltis theivora*; again cabbages can be made more resistant to attacks of the cabbage fly, *Phorbia brassicae*, by the addition of sodium nitrate or ammonium sulphate to the soil, (3) the fact that, though not actually repellent, the sap may not suit the food requirements of insects. There is probably some connection between the plant's resistance to insects and the physico-chemical properties of the cell sap. Further research is needed on the hydrogen-ion concentration, water content, osmotic pressure and electrical conductivity of cell sap and their possible correlation to the resistance or susceptibility of plants to the attacks of sap feeding insects.

SMALL FRUITS, VINES, NUTS.

(See also under STORAGE and PACKING.)

160. **Johansson, E.** 634.711
Sortförsök med hallon. (Raspberry variety trials.)
Sveriges pomologiska förenings Årsskrift, 1930, 31 : 185-97.

An account of trials with five common English raspberry varieties in Sweden in the years 1924-1930. At Alnarp and at Djurön, where the trials were held, Pyne's Royal and Lloyd George were found particularly well suited to Swedish conditions. The first named is recommended for growing on good, not too stiff, calcareous soil, particularly in smaller orchards owing to its

scanty shoot formation. Baumforth B, while excellent in flavour has proved inferior in yield. Results with Hornet have been similar to those with Baumforth B, whilst the lack of uniformity of type in the case of Hornet is noticeable. Superlative holds an intermediate position among the five varieties tested.

161. Swarbrick, T. 634.711

A preliminary report on the raspberry variety trials at Long Ashton.
Long Ashton Ann. Rept. for 1930, 1931, pp. 27-45, bibl. 2.

The figures for cropping trials at Long Ashton are given for the years 1927-30 of some 19 varieties of raspberry. It is noted that, with 2 exceptions in 1930, certain varieties are always near the head of the list, and that the heaviest year is the second year of cropping, the yield per cane decreasing yearly as the stools grow older. Notes are given on the numbers of canes of different varieties removed owing to mosaic disease. Under Long Ashton conditions the following are thought to be of possible commercial value: Improved Beehive, Lloyd George, Baumforth A, Herbert, Hornet A, Red Cross, Duke of Cornwall, Norwich Wonder, Pyne's Royal.

162. Grubb, N. H. 634.711

The cropping of raspberry varieties at East Malling.
East Malling Res. Sta. Ann. Rept. for 1928, 1929, 1930, II. Supplement, 1931, A.14, pp. 32-45, bibl. 2.

The writer gives short notes on fruit quality, growth, soil, preferences, and general health of 24 varieties in accordance with experimental data at East Malling. The cropping of 15 varieties for the period 1927-30 is reported and examined statistically. Baumforth A, Red Cross, Pyne's Royal and Lloyd George among those noted favourably at Long Ashton (see No. 161) all cropped well under the drier and otherwise different conditions of East Malling. Hornet A on the other hand cropped very poorly. Baumforth B cropped fairly well at East Malling in contrast to its Long Ashton performance. Devon behaved equally badly in both cases. No other varieties were tried out at both Stations. The author notes that Baumforth A, the heaviest yielder at East Malling, is only suitable for jam and cooking, while the colour and size of Helston which is second on the list detracts much from its value. Pyne's Royal, which is only 7th in yield, is often worth more than varieties of heavier yield owing to its large fruit.

163. Amos, J. 634.723.1-1.521

Some "rogue" varieties of black currants.
East Malling Res. Sta. Ann. Rept. for 1928, 1929, 1930, II. Supplement, 1931, A.14, pp. 46-51, bibl. 2.

The author gives detailed botanical descriptions with illustrations of bud and foliage characters of 3 "rogue" varieties of black currant commonly found among commercial Black Baldwin bushes.

164. Rogers, W. S. 634.75-1.521 + 1.543 + 1.542.27

Strawberry cultivation, strain, time of planting and deblossoming.
East Malling Res. Sta. Ann. Rept. for 1928, 1929, 1930, II. Supplement, 1931, A.14, pp. 52-64, bibl. 5.

A discussion of three years' records on randomized plots. The data up to the present show that three different strains of Royal Sovereign, which showed significant differences in the first generation, have been made much more uniform in subsequent generations by the elimination of weak and unhealthy plants and by selection of healthy runners. Early autumn planting has at East Malling given the best results in size of plant, amount of fruit and production of runners. The removal of blossom trusses in the first year resulted in a 6 per cent. increase in diameter of plant and a 32 per cent. increase in amount of runners.

165. **Greve, E. W. and Shoemaker, J. S.** 634.75-1.84
Relation of nitrogen fertilizer to the firmness and composition of strawberries.
Proc. Amer. Soc. Hort. Sci., 1930, 27 : 183.

According to mechanical pressure tests the spring application of nitrogen fertilizer resulted in slightly softer berries. The fertilizer treatment produced an increase in nitrogen content, and in catalase activity a lower percentage of total and reducing sugars and a lower pH. It does not seem, however, that the fruit was so soft or of such inferior handling quality as to preclude the spring use of nitrogen fertilizer, if such treatment would otherwise benefit the crop.

166. **Heermann, W.** 634.73
Die Züchtung einer Kulturheidelbeere. (Raising cultivated bilberries.)
Züchter, 1931, 3 : 38-44, bibl. 8.

Bilberry growing on a commercial scale is advocated by the writer and suggestions for preliminary spade work made. He notes that in America the foundation plant was *Vaccinium corymbosum* and that crossing has produced a heavy cropping, large fruited variety. *V. corymbosum* grows well and has proved frost resistant in Germany. Difficulty has been experienced in raising cuttings, but good results were got in Germany by using as a medium 2 parts peat and 1 part wood soil, the latter coming from a pine wood with leafy undergrowth, which included a large bilberry population, and containing (dry weight) 8 per cent. organic matter with a pH of 4.5.

167. **Sicard, H.** 634.8-1.8-2.411
Nos expériences du fumure de la vigne et le mildiou. (Mildew in relation to the manuring of the vine.)
Progrès agricole et viticole, 1931, 48 : 421-4.

It has been proved in the experiment fields at Grammont, France, that in a season when mildew is prevalent the least affected among the vines undergoing manurial trials are those in the control plots receiving no manure, or in the plots receiving sulphate of ammonia only. From this the author argues that since this increased immunity is evidently due to differences in the cell content of the leaves, rendering them less congenial media to the mycelium, research is desirable to determine what this difference is. Once this has been established, it should not be beyond the powers of science to devise a method for increasing the resistance of all vines.

168. **Vidal, J. L., and others.** 634.8-1.541.11
Sur la reprise des portes-greffes à la greffe-bouture. (Compatibility trials with different grape vine stocks.)
Progrès agricole et viticole, 1931, 48 : 375-8.

An account of experiments carried out with different rootstocks between the years 1925 and 1931, some 5,000 grafting operations being done on 41 B, *Rupestris* du Let, 3300, 1202, 93-5 and others. The percentage perfect grafts are given. The authors note among other things that : (1) Grafting with varieties such as 34 EM, 157-11, is always difficult owing to their small production of sufficiently strong wood. (2) Certain hybrids which at first make an excellent show in the nursery often fail later owing to faulty union. (3) *Berlandieri* hybrids are liable to delay the emission of roots, a fact which gives rise to imperfect plants, a very favourable temperature being essential to hasten root emission. Temperature would also affect the success of *Rupestris* hybrids, but to a lesser extent, since in such hybrids as 1202, 93-5, 3309, it is the initial union which is at fault. The authors consider that the covering of the rows of grafts in the soil with mulch paper deserves a trial. They are responsible for introducing into the Charente district the method of stratifying in a warm chamber.

169. **Adriance, G. W.** 634.521-1.547.5
Factors influencing fruit setting in the pecan.
Bot. Gaz., 1931, 91 : 144-66, bibl. 38.

The author has noted a definite drop of young nuts about 4 weeks after time of pollination,

which accounted for over 75 per cent. of the seasonal drop. This appeared to be due to lack of pollination. There was no evidence of self- or inter-incompatibility. The failure to pollinate was found to be due to dichogamy. The author suggests planting varieties known to produce pollen at an early date in every pecan orchard.

CITRUS AND SUB-TROPICAL CROPS.

(See also under STORAGE and PACKING.)

170. **Fawcett, H. S.** 634.3

Observations on citrus conditions in Mediterranean countries.

Calif. Citrograph, 1931, 16 : 94 and 132, 154 and 157, 208 and 244.

Separate articles deal with conditions in (1) Italy, (2) Spain, (3) Tunisia and Algeria. They are based on observations made by the author during a year's residence for this purpose in Mediterranean countries.

171. **Barnardo, W. S. E.** 634.323-1.55

Grapefruit production in Trinidad.

Trop. Agriculture, 1931, 8 : 51-3.

An illustrated article on methods of grapefruit cultivation on a small plantation in Trinidad. The majority of the 600 trees were planted in 1923 and the success of the venture can be gauged from the fact that the 1930 crop amounted to 114,322 fruits.

This account should be of interest to all those engaged in cultivating the grapefruit under natural rainfall.

172. **Uphof, J. C. T.** 634.337-1.547.4

Wissenschaftliche Beobachtungen und Versuche an Agrumen. I. Über die Blütenverhältnisse der Tahitilimonelle. (Notes and experiments on citrus varieties. I. The flower of the Tahiti lime.)

Gartenbauwissenschaft, 1931, 4 : 513-20, bibl. 2.

The author gives notes with diagrammatic drawings of the flower structure of this favourite seedless lime variety. He considers in detail the microsporangium and macrosporangium, and from his findings there is able to show why even the introduction of foreign pollen is normally unable to induce seed production.

173. **Toxopeus, H. J.** 634.1/3-1.541.11/12

Over de wederzijdsche beïnvloeding van onderstam en entrijs. (On the reciprocal influence of rootstock and scion.)

Reprinted from the Report of the 11th Meeting of the Experiment Station Staff Association, Java, pp. 22-35 : bibl. 41.

The paper is mainly a review of what is at present known on this subject, the author's interest being chiefly in the influence of the scion on the rootstock, which aspect, he says, has been little studied. To emphasize that this influence exists, he describes his own experiments with citrus. When budding scions and stocks both of which were susceptible to root rot gummosis, 45 per cent. of the stocks were attacked within 2 years, but when immune scions were budded on susceptible rootstocks not a single stock contracted the disease even after six years. He quotes Klotz* who found that the sour orange (*Citrus Aurantium*) which is most resistant to gummosis became less so when the very susceptible Washington Navel Orange was budded on it.

* Klotz, I. J. Inhibition of enzymic action as a possible factor in the resistance of plants to disease. *Science*, 1917.

174. **Webber, H. J.** 634.31-1.541.11
The basis of selection in the improvement of citrus nursery stock. *Proc. Amer. Soc. Hort. Sci.*, 1930, 27 : 114-9, bibl. 7.

The records of 387 Washington Navel Orange budded on Sour Orange (*Citrus Aurantium*) at Riverside Experiment Station, California, have been followed for eleven years from the time the seeds of the stocks were sown. The buds were all from one carefully selected tree.

By correlating the area of cross sections of the trunks of the seedling stocks with the area of cross section of one year budded trunks and with the area of scion trunk of the same trees when eight years old, sufficiently significant figures were obtained to indicate that large seedlings tend to produce large budded plants and large orchard trees. The rigid elimination of all small seedling or budded plants is thus shown to be necessary, if large orchard trees are required. The high correlation, however, was largely due to variants, i.e. types differing from the normal in some way, among the seedlings rootstocks. There were 43 variants and practically all produced marked dwarfing. They were nearly all weakly trees from the beginning and could have been easily recognized and discarded in the nursery. Similar results were obtained, it is interesting to note, when the volume of the size of top of the eight year old trees was correlated with the cross section of the one year old budded trunk. The elimination of the variants would in this correlation again have greatly decreased the co-efficient of comparison. Further tests were made, after elimination of variants, of selection based on diameter of seedlings, the trees being divided into—grade 1, seedling trunk diameter 2.2 cm. or over—grade 2, 2.1 cm.—and grade 3, diameter 2 cm. or less. The results showed that the average yields of grades 1 and 2 do not differ greatly, but the yield of grade 3 is considerably lower. Elimination of 3rd grade seedlings at budding would have increased the average yield per tree by 56.22 lbs., or at 1930 prices a gain of \$1.69 per tree during the early 5 years fruiting period with probably greater yields in after years. Similar tests made on one year budded trees after elimination of variants led the author to the conclusion that selection of budded trees is not necessary, if selection of seedling stock prior to budding can be done, the latter proving more effective and economical.

175. **Halma, F. F., and Haas, A. R. C.** 634.3-1.535.4:581.192
Solubility changes of inorganic constituents in citrus cuttings.
Bot. Gaz., 1931, 91 : 213-8.

The material under investigation consisted of stem cuttings with leaves and single leaf cuttings of Eureka Lemon and Navel Orange. During rooting changes occurred in the percentages of soluble Ca and K of the water-soluble ash in the dry matter. In stem cuttings the greatest reduction of soluble Ca occurred in the stem, the leaves actually showing an increase. In leaf cuttings there was also a loss of soluble Ca. The main loss in K was sustained by the leaves of the stem cuttings, while reduction occurred too in the leaf cuttings. When rooted lemon leaf cuttings were grown in culture solutions of different concentrations of Ca, the soluble Ca content of the leaves did not change to any great extent, but the soluble K content increased enormously. The solubility of Mg in the leaves remained unaffected.

176. **Prizer, J. A.** 634.3-1.8
Irrigation water as medium for distribution of soluble fertilizers.
Calif. Citrograph, 1931, 16 : 98, 126-7.

The author stresses the great waste involved in ordinary methods of applying fertilizers. He urges the use of a "fertilizer applicator" giving an illustration thereof. This dissolves and feeds fertilizer into the irrigation water, so making it available to the important root zone. Trials have shown an increase of phosphates down to 24 inches, where prior to the application practically none had been found below the first two or three inches. The writer claims that not only is it possible to apply small doses at intervals without added cost but also such soil amendments as sulphate of iron, colloidal sulphur, etc.

177. **Samuels, C. D.** 634.3-1.84

Relations of a sustained nitrate concentration to growth of citrus.

Calif. Citrograph, 1931, 16 : 263.

Experiments with a number of citrus groves in eastern Los Angeles county, California, have indicated that irrigation lowers the nitrogen content of the soil and that growth is below normal after irrigation. An application of 140 lbs. of nitrate nitrogen per acre over a depth of three and one half feet of soil, just before irrigation, or in the irrigation water, produced a growth increase above the average at every measurement during the irrigation season. In view of the fact that nitrates are, as an average of all groves studied, much higher than necessary during the period December to May and lower than is advisable from May to December, a variation in the conventional fertilizer application would appear to be of benefit. The best method of carrying the fertilizer into the root zone appears to be by the introduction of commercial fertilizer into the irrigation water.

178. **Pollacci, G.** 633.956

Ricerche sperimentali sulla coltura in Italia, a scopo industriale, del Lauro Canfora. (Experiments on the commercial growth of camphor in Italy.)

[Latin summary.]

Atti dell' Istituto Botanico della R. Università di Pavia, 1929, 1 (Ser. 4) : 1-58.

Five years' investigation on *Cinnamomum Camphora* has shown its abundance in Italy where favoured by conditions. It was possible to select a variety containing 2.7 per cent. camphor in the leaves and 0.6 per cent. oil of camphor. No difficulty was found in propagating this by grafting on *C. glanduliferum*. The process of extraction is simple and inexpensive and the camphor does not evaporate on drying the leaves.

179. **Davis, W. B. and Church, C. G.** 634.451-1.547.6:547.313.2

The effect of ethylene on the chemical composition and the respiration of the ripening Japanese persimmon.

J. Agr. Res., 1931, 42 : 165-82, bibl. 19.

An account of tests carried out with the Hachiya, the chief astringent variety in California, and with the non-astringent variety Fuyu. Low concentrations of ethylene were applied at intervals during maturation from September 15th, when the fruit was almost entirely green but nearly full size, to October 27th when it was considered commercially mature. This treatment stimulated softening, colour development and respiratory activity in both varieties. Astringent taste decreased and moisture increased in the Hachiya, and in the Fuyu insoluble solids decreased simultaneously with increase of soluble solids. Its stimulative effect on respiration declined

and the respiratory quotient $\frac{CO_2}{O_2}$ showed a tendency to increase as the fruit ripened, especially in the last stages and in the stored fruit. Ethylene seemed to act on the varieties studied through its effect on the general metabolism.

180. **Davey, W. H.** 588.427

Passion fruit culture.

J. Dept. Agr. Victoria (Aust.), 1931, 29 : 29-31.

Being a native of S. Brazil the passion vine does best in a warm, humid atmosphere. The plant is a gross feeder, so that care should be taken to keep the soil in a high state of fertility. In S. Victoria, where in the season 1928-9, 566,152 passion vines were grown, a green cover crop is considered essential, the recommended varieties being 1 bushel of tick beans and $\frac{1}{2}$ bushel of peas to the acre. 3 cwt. per acre of a mixture of superphosphate and bone fertilizer should be added to ensure good growth, and the crop should be ploughed under at the flowering stage. Light, friable soils are the most suitable. In selecting fruits for seed purposes those vines which have a large proportion of light weight fruits should be avoided. Late ripening fruits will be

found to have seeds of a greater viability than those ripening earlier. The selected fruits should be allowed to remain on the vine till fully matured. The vines are grown on trellises 12 ft. apart, there being 18 ft. between each vine in the rows. They fruit in their second year and are in full bearing in the fifth and sixth. The passion vine is little troubled with insect pests, but fungus diseases are occasionally troublesome, chiefly a species of *Gloeosporium*, while Collar Rot is also occasionally in evidence. *Gloeosporium* can be controlled by Bordeaux mixture at a strength of 6.4.50 for the first application and 6.4.70, if another spraying is necessary. Collar Rot is best dealt with by removal of the affected parts and spraying the wound with lime sulphur 1 in 20 or with standard Bordeaux mixture.

TROPICAL CROPS.

181. **Gilbert, S. M.** 633.74(729)
Cocoa industry of Trinidad.
Council paper No. 4 of 1931 Report by the assistant director of Agriculture of Trinidad and Tobago, pp. 31, numerous maps, figures and tables.

The report is based on a comprehensive survey of the Cocoa Industry of Trinidad, carried out by some thirty teams of inspectors during the period April to September, 1930. The author sifts and tabulates the data obtained, faces and summarizes the very serious facts of the situation, and makes definite recommendations for the permanent strengthening of the industry.

He points out that it is within the power of every owner of an estate to improve immediately the efficiency of that estate by raising the standard of management and he suggests how this may be done. He considers that hope for the future lies in the development of research into methods of economically increasing the yield of first grade cocoa per unit area, e.g. by improvement in bearing capacity, by improved cultivation and manurial practices, by elimination of cocoa on non-paying areas, by provision of cheap capital, by control of diseases and pests, especially by cultural methods. The chief means to progress among small holders would appear to lie in education.

182. **Malins-Smith, W.** 633.74(729)
The cocoa industry of Trinidad.
Proc. Agric. Soc. Trinidad and Tobago, 1931, 31 : 61-71.

The author decries the hopeless attitude of many planters who cut expenses to a minimum but otherwise blindly follow traditional methods. He considers that both pruning and overhead shading are carried to excess and that a drastic change in these two practices alone would be of the greatest benefit.

183. **Cooke, F. C.** 634.61
The present-day position relating to Copra research and practical issues concerned therewith. (Paper presented at the 2nd inter-departmental Agricultural Conference at Kuala Lumpur, October, 1930.)
Malayan Agr. J., 1931 : 19 : 55-9 The economic factors of copra research.
128-36 Factors of quality in copra. 166-72 Types of Malayan copra.

The author notes the decline in quality of Malayan copra, discusses what is meant by quality and how it is affected. He considers that the ultimate object of producers should be a copra equivalent in physical condition, appearance and oil content to F.M.S. (i.e. best quality=fair merchantable sundried) Ceylon copra. He makes several recommendations regarding the methods of gathering the nuts and after-treatment and notes the necessity for co-operation and organization of growers.

184. **Huggins, H. D.** 634.81
Coconut cultivation in British Guiana.
Trop. Agriculturist, 1931, 76 : 171-9. (Reprinted from *Agr. J. Brit. Guiana*,
Vol. III, No. 3, Sept., 1930.)

The author discusses the cultural practices most suited to British Guiana conditions, devoting sections to (1) soils, (2) selection of seed nuts, (3) nursery work, (4) field culture, (5) yields and costs, (6) diseases. Under section (4) he stresses the importance of individual tree records.

185. **Chevalier, A.** 633.73-1.541.11
La greffe des caféiers sur des Rubiacées n'appartenant pas au genre *Coffea*.
(Grafting coffee on *Rubiaceae* other than those of the genus *Coffea*.)
Rev. Bot. Appl., 1931 : Bull. 113 : 39-40.

The author refers to a note by M. Jacques in the *Revue Agr. Nouvelle-Calédonie* for June, 1930, stating that he has made several successful grafts of *C. arabica* on a *Gardenia* which grows in abundance in the South of New Caledonia. He remarks that the particular *Gardenia* (name not given) grows excellently on soils with a very high mineral content unsuitable for ordinary crops. The discovery seems to merit watching.

186. **Kirkham, V. H.** 633.832(67.81)
The clove industry in Zanzibar.
Ann. Rep. Dept. Agr. Zanzibar for 1929, 1930, pp. 2-12.

A report on the current position in the clove industry. Suggested causes for the tremendous annual variation in the size of the clove crop are discussed. Probably three factors are involved. (1) The nature of the climatic stimulus to flowering. (2) The phase in the periodicity of the trees. (3) The reactions from a previous stimulation. The author considers that research is needed on this problem, since ability to forecast the size of the clove crop before the previous year's stocks are sold would be of the utmost financial value to the industry. The new Agricultural Produce (Export) Degree, 1929, which prevents the export of cloves under standard quality has had a most beneficial effect, the bales rejected at the wharf falling from 2,635 in 1929 to 497 in 1930. The quality of a sample is gauged by (1) dryness, (2) freedom from foreign matter, (3) colour (reddish brown, dark brown, black, dull or bright), (4) form (with or without crown, smooth or wrinkled), (5) size (weight per 100 cloves), (6) oil content. The prohibition of the export of cloves containing more than 16 per cent. of moisture caused some dismay at first, but the conditions are now quite successfully met. The cloves are dried on mats over a sunbath type of kiln such as is used on Government Plantations for drying copra. The cloves are spread 1½ lbs. per sq. ft. and turned over at intervals, the temperature not being allowed to rise above 60°. Under these conditions the cloves dry out to a moisture content of 10 per cent. by the end of the second day and present a better appearance than the sundried article. There is no material loss in oil.

187. **Willo, J.** 633.88.781.6(85)
Der Kokastrauch und seine Kultur in der "Montaña" sowie über die Kokaverwendung in Peru. (Coca, its cultivation in La Montaña and its use in Peru.)
Tropenpflanzer, 1931, 34 : 99-109, bibl. 10.

An account of the growing of coca (*Erythroxylon Coca* Lam.) in the Libertad Department of Peru, and the trade in it, internal and foreign, together with notes on the use of the product in Peru. Two varieties are noted, that from Huanuco and from Cuzco with large leaves rich in cocaine, and a variety with smaller leaves less rich in cocaine but more numerous. A moist warm climate is best, night temperatures of below 50°F. being prohibitive to good leaf development. It thrives particularly well in Peru on the slopes of the Amazon valley at altitudes of between

800-2,000 metres. It prefers a humus covered, deep clay soil. New plantations are generally made on virgin forest soils, cleared and planted with maize for 2 years previously. These last some 80-100 years. Cuttings or seedlings are used, the latter being preferred. The seed is removed from the shells and planted very shallowly in rows to germinate in 30-50 days' time. The plants reach a height of 30-40 cm. in about a year, when they are planted out. The plantations will have previously been cleared, burned and planted with *Zea Mays*, *Manihot utilisima*, *Colocasia esculenta*, or *Arracacia esculenta* for 2 years and then left fallow 2 years. The young plants are set out in rows 1 metre apart, about 1.8-2.0 metres between plants, in holes of about 50 cm. deep and 40 cm. square. This is done preferably in rainy weather and earth is left adhering to the roots. The holes are filled in so as to leave a slight depression, which collects rain water. Shade is a great asset in early years, and is afforded by planting maize or cassava, between rows. In very sunny situations more permanent shade plants such as banana, coffee etc. are used. Regular harvesting of the leaves takes place in the 4th or 5th year after planting out, when the bush is 1-1½ m. high. Only the older leaves are taken, and, once started, picking will normally take place at intervals of 3-4 months. Weeding is done at time of picking. No manures are ever given. Every 12-15 years the plants are cut back in somewhat primitive fashion. Yield varies but may be reckoned at about 16 cwt. dried leaves per acre yearly. The chief enemies of Coca are the two Lepidopterous insects *Eucleodora cocae* Busck and *Eloria* (*Penora*) *noyesi* Schaus, the fungus *Stilbum flavidum* Cooke being less important. The plantations last some 80-100 years, after which they are allowed to lapse again into forest. The writer describes the drying of the leaves and the various ways by which the product comes into commerce.

188. **Cooper, H. R.**

633.72-1.84

Effect on tea crop of different applications of nitrogen as manure in single and divided doses.

Indian Tea Assn. Sci. Dept. Q. J., 1931, pp. 1-23.

The tea was divided into 10 composite plots, all of which had yielded almost exactly alike for two years. Subsequent differences were therefore ascribed to the effect of the treatments. The nitrogen was applied as sulphate of ammonia, each 2 lbs. nitrogen being accompanied by 1 lb. phosphoric acid as superphosphate, and 1 lb. potash as sulphate of potash. The total applications of nitrogen per acre were 40 lbs., 80 lbs., and 120 lbs. applied in (a) one dose on March 15th or (b) two doses March 15th and June 15th or (c) three doses March 15th, May 15th, July 15th. Results showed that it paid to apply a total of 40 lbs. nitrogen in one single dose, but that in the cases of 80 lbs. and 120 lbs. doses there is little difference in crop whether the total be applied in one dose or two. This applies to first year of application only. Over a series of years the difference to the total crop whether manures are applied in single or divided doses was insignificant. With three doses some efficiency is lost, probably owing to the July dose coming too late to have effect the first season. 80 lbs. in one dose compared to two doses of 40 lbs. gave nearly double the increase to the end of June, but possibly at the expense of quality, the increase being from increased rate of growth rather than from increased size of bush and a greater number of plucking shoots. It is concluded that pending further information spring doses exceeding 40 lbs. of soluble nitrogen are best avoided. Up to 40 lbs. the increase is proportional to the amount of manure; over this amount there is a loss of efficiency. No significant difference was observed whether the second dose was applied (following a first dose on March 15th) in May, June or July. An important point is the long lasting effect on crop of sulphate of ammonia, the effect of the March application being quite marked even in November. Since it was proved that there is no storage of surface nitrogen in the soil or subsoil after May 21st from a March 15th application, the late increases in crop are considered to be due to the effect on the bush of the increased nitrate content of the soil early in the season. Experiments also show that 120 lbs. of nitrogen per acre is by no means the limit of manuring for crop production for this particular tea at any rate (Mesai Manipuri var.) and that large increases could have been obtained by still larger doses.

The large increases in crop obtainable by heavy manuring open up possibilities of great interest, such as the abandonment of poor areas and the manuring of better areas to adjust the balance and so produce a better class of tea at less cost. Gardens having a shortage of labour should not attempt these experiments or the bushes will get out of control and the quality of the leaf deteriorate. A single dose of 40 lbs. nitrogen in available form may be expected to produce an increase of 2 maunds per acre of good tea in the first year.

189. **Bunting, B.** **633.855.34**

Experimental work in relation to oil palms.

Malayan Agr. J., 1931, **19** : 65-73.

Practical investigations in relation to the oil palm are being carried out by the Department of Agriculture of the Straits Settlements and the Federated Malay States on the following subjects: Seed selection; introduction of new varieties; cover crops and green manures; germination; interplanting rubber with oil palms; pruning of leaves; removal of female inflorescences from immature palms, manuring, artificial pollination, harvesting.

190. **Milsum, J. N. and Greig, J. L.** **633.855.34:581.162.3**

Pollination of oil palms under field conditions.

Malayan Agr. J., 1931, **19** : 123-7.

A field pollination experiment with twenty acres of young oil palms conducted during a period of 4½ years is described. The increase of crop due to artificial pollination is shown to be 103.9 per cent. for the period. The bunches pollinated artificially show an increase of average weight over the bunches from the control palms of 104.66 per cent. for the whole period. The palms receiving artificial pollination were patrolled every alternate day, and a maximum of one female inflorescence per palm pollinated every five weeks, i.e. approximately ten pollinations per palm per annum. Fruit bunches were harvested as they became ripe. The results have been examined statistically and show no material difference in average weight of naturally pollinated bunches from the two sets of palms. On the other hand there is a marked significant difference between the weight of bunches harvested from the artificially pollinated and control palms. Hence it may be deduced that the crop increase is due solely to artificial pollination.

191. **Frey-Wyssling, A.** **633.912:581.45**

Abnormal leaves of *Hevea brasiliensis* as a clonal characteristic. [Dutch-English translation.]

Archief voor de Rubbercultuur, 1931, **15** : 114-24.

At the A.V.R.O.S. Experiment Station, Medan, four of the new *Hevea* clones show modifications of the ternate leaf, which so far have not appeared in other clones and consequently can be used as reliable clonal characteristics. The paper deals with these abnormalities, concluding with a more general description of the teratology of the *Hevea* leaf. Among such modifications clone 183 has modified a nectary into a leaflet while clone 71 has developed dwarf and rudimentary extra leaflets. Clones 185 and 214 have oligophyllous leaves which constitute a valuable characteristic but less valuable than the teratological phenomena of clones 183 and 71.

192. **de la Bathe, H. P.** **634.6**

Le Raphia de Madagascar. (Madagascar raphia.)

Rev. Bot. Appl., 1931, **11** : 113 : 4-17.

A plea for the proper cultivation and improvement of the *Raphia* palm, one of the most important of the natural resources of Madagascar. At the present time the plant is in danger of eventual destruction owing to the inefficient administration of the laws intended to preserve it. Vast areas of untenanted swamp land are available on which plantations could be made.

193. **Blatt, R. J.** 634.653(68)
 Avocado growing in South Africa.
Rhodesia Agr. J., 1931, 28 : 270-77.

The author gives a short account of the history of avocado growing in California since the introduction of the tree from Nicaragua in 1856, stating the present acreage in California as 2,500 acres in bearing and 5,000 in non-bearing trees. He strongly deprecates the use of the West Indian or seedling stocks and gives notes on the present availability of Mexican and Guatemalan stocks. To intending growers the Mazapan alone of specially recommended varieties is available, but others likely to be available shortly at the Alkmaar nurseries are Fuerte, Nabal, Puebla, Taft, Queen, Dickinson and Anaheim. Six varieties, which have shown special resistance to cold, are or shortly will be obtainable at Alkmaar, viz., Fuerte, Puebla, Duke, Blake, Northrop and Topa Topa.

194. **Russell, G. T.** 634.653-1.55
 Information on production of Avocado trees at various ages.
Calif. Citrograph, 1931, 16 : 124-5.

The editor of the California Citrograph states that this is the first attempt as far as he knows, to secure reasonably definite practical information on the production of avocado trees. Production figures of Fuerte trees, which comprise 75 per cent. of all commercial plantings in S. California were: 664 three-year old trees from 5 different plantations averaged 9.38 lbs. a tree, or a total of 6,230 lbs.

623 four-year old trees from six orchards in various districts averaged 43.79 lbs. of a total of 27,282 lbs.

588 five-year old trees in five different orchards in varying locations averaged 56.86 lbs. or a total of 33,434 lbs.

In mixed variety orchards the average per tree in lbs. was 2 years 0.83, 3 years 8.36, 4 years 28.61, 5 years 41.10, 6 years 36.40, 7 years 42.86, 8 years 20.85. The preceding tables were calculated from the records of a number of orchards at each age. Continuing with one orchard only of about 125 trees, the yields for succeeding years were—9 years 118.04, 10 years 88.44, 11 years 224.82, 12 years 77.63, 13 years 248.83.

195. **Walker, A.** 634.771(67.21)
 Le bananier plantain au Gabon. (The plantain at Gabon.)
Rev. Bot. Appl., 1931 : 11 : 113 : 18-27.

A list of local varieties of banana under local names with short descriptions and notes on their uses among the natives.

196. **Smith, F. E. V.** 634.771-2.48
 Experimental work on killing roots of bananas with chemicals.
J. Jamaica Agr. Soc., 1931 : 35 : 48-9.

At present plants suffering from Panama disease have to be dug out and destroyed. The displaced and infected soil is frequently washed down the hillsides and there is danger of the disease being thus spread. A method has been sought by which banana roots may be destroyed without digging. Experiments have proved that while all other mineral oils including commercial mixtures were useless, the commercial grade of oil known as Heavy Gas Oil, proved absolutely effective on all classes of land. The treatment consists of cutting down the tree and all suckers to within six inches of the soil and applying the oil on the cut surfaces and on the soil immediately surrounding the suckers so that it can penetrate and touch the eyes. The material cut down should be cut up into small pieces and treated with lime in the usual way. It is essential that the correct grade of oil should be used. The oil used successfully in these experiments was Heavy Gas Oil, Sp. Grav. 0.856 at 60°F., Flashpoint P.M. 180°F. Two to three pints per tree is required. The treatment can be carried out regardless of weather, and by giving a kill of practically 100 per cent. the trouble and expense of suckering is eliminated.

STORAGE.

(See also under TREE FRUITS, DECIDUOUS *Manuring*.)

197. **Smith, W. H.** 664.85.11

Loss of water from fruit.

Report of the Food Investigation Board for 1930, 1931, pp. 55-61.

This is a summary of the writer's investigations during the seasons 1928-9 and 1929-30 into the relationship between the rate of loss of water from apples in still air and the relative humidity of the atmosphere. Cox's Orange Pippin and Bramley's Seedling afforded the material and gave slightly different results. Thus an investigation of the relationship between the rate of evaporation from single apples at 3°C. and 15°C. and the relative humidity of the atmosphere has shown that the rate of evaporation increases more slowly, the further the relative humidity is lowered. And so with Cox it is found that little increase might be expected, were the relative humidity to drop below 65 per cent. Yet Bramley's Seedling which, despite greater size, appears to lose water less rapidly than Cox, would probably continue to show an increase in rate below 65 per cent. relative humidity. The writer concludes that the rate of loss of water under given external conditions seems to be governed by the resultant of a number of internal factors, whose precise nature is at present unknown.

198. **Zilva, S. S., Kidd, F., and West, C.** 634.11:577.16

Vitamin content of apples.

Report of Food Investigation Board for 1930, 1931, pp. 65-6.

In continuance of investigations on the possible botanical significance of vitamin C in plants, two varieties of apple, Newton Wonder and Lane's Prince Albert, were tested for their vitamin content. Newton Wonder was found to resemble in activity most of the varieties other than Bramley's Seedling. Lane's Prince Albert, though less potent than Bramley's Seedling, was markedly more active than most of the other varieties investigated. Immature Bramleys gathered in July possessed an activity per gram of tissue approximately similar to that of apples harvested at the normal time. The vitamin is therefore either synthesized by the apple or is supplied to it as it grows on the tree. The vitamin is not apparently affected by storage under frozen conditions. There were indications that Bramley's Seedlings allowed to age at 3°C. in air lost less vitamin than at 10°C. This would imply that the greater deterioration in the anti-scorbutic activity of apples in "gas storage" than in "cold storage," previously observed, was due rather to the temperature than to the composition of the atmosphere. Further research is needed here. The concentration of vitamin C was found to be six times greater in the peel than in the region of the core. This may prove to be significant in view of the higher enzymic activity in the periphery of the apple.

199. **Trout, S. A. and Tomkins, R. G.** 664.85.035.1:547.281.2

The use of acetaldehyde in the storage of fruit.

J. Council Sci. and Ind. Res. Australia, 1931, 4: 6-11.

This is an account of preliminary experiments on three methods of using acetaldehyde. Dipping fruit into solutions was unsuccessful with citrus fruits. The method of short exposure (1-4 days) to air containing certain concentrations gave some measure of success in grape storage. Fruit stored in atmospheres containing small quantities of acetaldehyde remained in certain instances in a sound condition considerably longer than fruit stored in air. The range of concentrations controlling mould development without damaging the fruit is very limited and further study is needed on this point.

200. **Motz, F. A.** 664.85.11-632.1
Scalded apples on the European markets.
Better Fruit, 1931, 25 : 10 : 9 : bibl. 6.

Scald, a transportation and storage disease, is said to be particularly serious on the following varieties of American apples : York, Imperial, Grimes, Arkansas (Mammoth Black Twig), Rome Beauty, Rhode Island Greening, Stayman Winesap, Yellow Newtown, Baldwin, Winesap, Wagener, listed more or less in order of susceptibility. The writer considers that picking only when properly matured, the proper distribution of shredded oiled paper (not waxed) throughout the barrels and the use of oiled wrappers in boxed apples will largely prevent wastage from this cause.

201. **Davenport, A. B.** 664.85.11:632.1
Scald of apples in storage.
Better Fruit, 1931, 25 : 10 : 14.

The author agrees with Motz in considering that immaturity of picking leads to scald occurrence in storage, contributory factors being delay in storage, and long periods of loose storage before packing. He ranks susceptibility (in the Yakima Valley, Washington) thus : Black Twig, Jonathan, Rome, with the Newtown, Winesap and Delicious quite free except in case of late spring storage. He stresses the efficacy of oil wraps, their action being due, he thinks, to absorption of the gases given off by unripe fruit.

202. **Palmer, R. C.** 634.11-2.1:664.85.11
Recent progress in the study of Jonathan breakdown in Canada.
Scientific Agriculture, 1931, 11 : 243-58, bibl. 15, and *Proc. First Imp. Hort. Conf.*, 1930, 1931, Pt. III, pp. 25-37.

The breakdown discussed in this paper is a physiological disease which occurs in apples grown in Western North America, a disease to which the Jonathan Apple is especially susceptible. Breakdown seldom develops until about a month after picking. The injury is first evident as a light brown discoloration of the flesh and in this stage can only be detected by cutting the fruit. The diseased areas are indefinite in outline and usually occur in the region of the vascular bundles or near the skin. In the advanced stages of the disease affected specimens can often be identified by the dull colour of the skin and spongy texture of the fruit. As a result of extensive experiments at the Summerland Experiment Station over a period of seven years the most important findings from the standpoint of practical control of the disease may be briefly summarized as follows :

(1) Susceptibility of fruit to breakdown is increased by an orchard environment which promotes very vigorous growth. (2) Breakdown can be prevented without serious reduction of yield or grade by picking the fruit at the proper stage of maturity. (3) Change in colour of the skin on the unblushed side of the fruit is a fairly reliable maturity index. (4) In order to prevent breakdown, the fruit from trees carrying a light crop must be picked earlier than that from trees carrying a heavy crop. (5) The development of breakdown can be delayed but not prevented by storage at low temperatures.

PACKING, PROCESSING, FRUIT PRODUCTS.

203. **Brereton, W. le Gay** 634.1/2-1.564
Fruit packing equipment.
New South Wales Dept. of Agr., Farmers' Bull. 165, 1930, pp. 28.

The writer in very practical manner and with some 34 illustrations deals in turn with the chief points in packing : Lay out of shed, both individual and co-operative—grading machines—packing benches, for use where graders are not used—packing trolleys—wrapper holders—nailing press and problems of nailing without a press—moulds for making fruit cases—nail strippers—wiring machines—stacking—gravity conveyors—trucks. Diagrams and illustrations show both the use and the method of making the apparatus referred to.

204. **Barker, J.** 634.11-1.564

Experiments in packing apples.

Report of Food Investigation Board for 1930, 1931, p. 68.

Experiments were undertaken by the New Zealand Fruit Control Board assisted by the Division of Horticulture to ascertain which packs cause the least amount of bruising. The fruit used was Worcester Pearmain, an apple which bruises easily. On examination in England a close correlation was found to exist between the amount of fungal rotting and the extent of bruising as also clearcut differences between the packs. Since the packages used, half-cases and trays, cannot on account of cost be used in ordinary marketing, it is hoped that further trials will be made with commercial boxes.

205. **Pole Evans, I. B. and Hahne, B.** 634.3-1.56:664.85.3

Handling of citrus fruits in relation to subsequent wastage, with reports on inspection of packing-houses in various South African citrus areas.

Union of S. Africa Dept. Agr. Bull. 98, 1931, pp. 20.

The wastage in S. African oranges during the last two seasons having become alarmingly high, growers and their organizations have blamed in turn the Department of Agriculture, the railway administration, the cold stores and the ships. Dr. Hahne therefore at the request of Dr. Pole Evans conducted a personal investigation into the methods of those packing houses which showed consistently bad returns, and in each case was able to show that there was no obscure disease at work demanding instant scientific investigation, but that nearly all the wastage was due to abrasions caused by mechanical defects in the packing machine, by faulty handling and in the field by careless picking. He is confident that when these defects are remedied the wastage from these packing houses will be materially diminished.

206. **Morgan, A. F. and others.** 664.85.21/22:577.16

Effect of drying and sulphuring on vitamin C content of prunes and apricots.

J. Agr. Res., 1931, 42 : 35-45, bibl. 15.

Two lots of frozen fresh prunes, only one of which was previously evacuated, both retained vitamin C, but frozen, fresh apricots only retained it, when their cases were previously evacuated and filled with nitrogen before freezing. Sulphured, dehydrated and sun dried prune products kept the vitamin C satisfactorily only when the fresh fruit had been previously dipped in lye. All unsulphured products of both fruits, whether sun dried or dehydrated, were without antiscorbutic value.

The dehydrated products retained vitamin C more completely than those sun dried. The dehydrated and sun dried apricots containing 450-500 or more parts of SO_2 per million retained the antiscorbutic property more or less completely. With less than this, all products lost the property completely.

207. **Thomas, J. E.** 664.85.047:632.944:547.313.2

Ethylene oxide as a new fumigant for dried fruits.

J. Council Sci. and Ind. Res. Australia, 1931, 4 : 53-4.

These tests, which were limited in number and on a laboratory scale, showed, however, that ethylene oxide is an effective fumigant against the eggs, larvæ and pupæ of *Plodia interpunctella*, the dried fruit moth. At mean temperatures above 68°F., with a dosage rate of 2 lbs. per 1,000 cubic feet, an exposure of only 4 hours sufficed to destroy eggs and larvæ in experimental packs.

208. **Barker, J.** 634.1/2-1.547.6

Ripening fruit prior to retail.

Report of Food Investigation Board for 1930, 1931, p. 67.

Experiments carried out at the request of the South African Deciduous Fruit Exchange suggest that artificial ripening may at times be advantageous. Experiments were planned to discover whether the several weeks required to ripen South African pears after arrival could be reduced

to a few days, by using higher temperatures. Results varied with the variety. Thus a temperature of 72°F. reduced the time of ripening of Doyenné de Comice, Beurré Bosc, Josephine and Glou Morceau by 70 per cent. Winter Nelis lost quality under the same test. Caution is required and further experiments are needed.

209. **Ramsay, A. A.** **634.55-1.56**

Bleaching almonds.

Agr. Gaz. N.S. Wales, 1931, **42** : 153-4.

A description of successfully tested methods for treating and improving the appearance of weather stained almonds in shell by dipping in chemical solutions. Chemicals used are sulphurous acid, chloride of lime, acetic acid.

210. **Mrak, E. M.** **634.22-1.57**

Utilization of prunes.

Fruit Products J., 1931, **10** : 216-7.

Suggestions are made for the manufacture of prunes into the following products: Ice cream; prune milk shakes; pastries; prune pulp as an infant's food; prune cereal; prune juice; canned prunes without syrup; canned fresh prunes; canned peeled fresh prunes. Corrosion of tin plate and formation of hydrogen gas can now be controlled following investigations by University of California Fruit Products Laboratory.

A new product, prune pulp or sieved prunes has developed and is likely to prove a practical method of disposing of small and off grade but wholesome prunes.

211. **Cruess, W. V.** **664.85:545.371**

The relation of pH value and preservative action.

Fruit Products J., 1931, **10** : 242-4, 257, bibl. 8.

In canned and bottled provisions the preservative action of sodium benzoate and some other preservatives depends in a remarkable degree upon the pH value. A summary of the data recently accumulated is given for sodium benzoate and also for sodium salicylate, sulphurous acid, acetic acid, sodium chloride and formaldehyde. The observations appear to prove that the toxicity of weak acids to micro-organisms depends upon the reaction (acidity or pH value) of the food. Thus benzoic acid, acetic acid, sulphurous acid and salicylic acid in low concentrations prevent growth of micro-organisms in acid solutions, while at neutrality they appear to lose their toxicity almost completely. It would therefore appear that the free acids and not their salts or ions are the preservative agents. Salt and formaldehyde represent two other classes of compounds, and in support of the above theory their preservative action is little affected by the pH value of food.

212. **Taylor, H. V.** **663.3**

The improvement of English cider.

J. Min. Agr., 1931, **37** : 1095-1100.

The author, after noting the popularity of cider of old and its decline, passes to a consideration of the present more hopeful position. The work of the National Fruit and Cider Institute at Long Ashton would appear to indicate that apples may be grouped for cider making purposes into three groups: sharp or high acid; sweet or low acid; bitter-sweets or varieties low in acid but rich in tannin. When the decline in cider making occurred, very many trees of this third group were scrapped or top-grafted to high acid varieties. There is now in the country yearly a large number of cull apples from among the culinary or low value dessert varieties, which by blending with bitter sweets could be made into a good quality cider. At present most of the bitter sweets are imported from France. He suggests that growers would be well advised to grow sufficient of such bitter sweet types as Knotted Kernel and Dabinett and of sweet types such as Sweet Alford to supply the demand.

213. **Barker, B. T. P. and Grove, O.** 663.32

The clarification of ciders by the centrifuge method—I.

Long Ashton Ann. Rept. for 1930, 1931, pp. 199-204.

An account of preliminary experiments to test centrifuging against filtering as regards clarifying and controlling the fermentation of ciders. In certain cases the older method of simple racking was also used for comparison. A pump filter of the Lieberich type was used. The authors consider that interesting possibilities are opened up. They state that, if the one season's results are confirmed by future trials and shown to be typical for seasons of varied description, there will be available to the cider maker a method of great utility for fermentation control purposes and a means of enhancing the quality of his products. In that event modern methods of cider making are likely to undergo a revolutionary change.

214. **Grove, O.** 663.8:634.11

Apple juice concentrates.

Long Ashton Ann. Rept. for 1930, 1931, pp. 209-14.

An examination of concentrate production by the evaporation method at a relatively low temperature and under reduced pressure shows that this method can produce an article with characteristic apple flavour, though possessing a certain pasteurization flavour and inferior on this account to that of concentrates prepared without heat. The addition of freezing to the above method adds to the colour but does not appear to justify its additional cost. Operations in making "apple treacle" are described. They consist of (a) the removal of pectin from the juice, (b) the adjustment of the acidity of the juice to a suitable degree, and (c) the adjustment of the sugar concentration by addition of sugar and subsequent concentration of the sweetened juice.

215. **Grove, O.** 663.34

The prevention of deposit formation in perries.

Long Ashton Ann. Rept. for 1930, 1931, pp. 205-8.

Experimental data lead the writer to consider that, provided the same results can be obtained with all varieties of pears used for perry making, as indeed seems probable, then the simple addition of 3 ozs. (or possibly less) of potassium metabisulphite per 100 gallons of perry will eliminate the serious drawback of deposit formation.

BOOK NOTES.

216. **Gardner, V. R.** 634.23

The cherry and its culture. 1930, Kegan Paul, Trench, Trubner and Co., London, and Orange Judd Publishing Co., New York, \$1.35, pp. 128,

A small book written both for the amateur and the commercial producer from an American standpoint. Some remarkable figures are quoted in discussing the subject of pruning. The author claims that the customary moderate to heavy annual pruning (taking out cross branches and twigs where the crop appears too thick) is extremely detrimental to the crop. He asserts that trees should be left practically untouched after the 3rd year, and instances the case of a Michigan grower whose unpruned blocks of Montmorency yielded an increase of 7,114 lbs. per acre over the pruned blocks in their 7th year, and even larger proportionate increases during the 3 previous years, and states that this increase is now permanent. A chapter is devoted to fruit setting, the known facts on the pollination of the cherry being stated simply and clearly. Another chapter deals with types of winter injury such as winter sunscald, bark splitting, blackheart, dieback, root killing and bud killing. The treatments of pests and diseases are described in detail, as is indeed the entire routine of cherry growing from the choice of the ground to the final marketing.

217. **Clark Powell, H.** 634.3
The culture of the orange and allied fruits, 1930, Central News Agency Ltd., South Africa, £1.1.0, pp. 355.

A manual on the cultivation of citrus written chiefly from a South African standpoint, though there are also chapters describing the cultural practices of other citrus growing countries. The usual routine of citrus growing is dealt with in detail including even instructions for the layout of an experiment plot on statistical lines and an explanation of the mathematical analysis of the results. Emphasis is laid on the necessity for bud selection. There are numerous illustrations, maps and plans.

218. **Ochse, J. J. and Bakhuizen van den Brink, R. C.** 635.1/8(92)
Vegetables of the Dutch East Indies. (English edition of Indische Groenten.) 1931, Archipel Drukkerij, Buitenzorg, gldrs. 17.50, pp. 1006.

Contains botanical descriptions and cultural instructions for growing 389 edible plants found in the Dutch East Indies. An accurate line drawing accompanies every description. It should prove a useful reference work to all engaged in tropical agriculture.

219. **Ochse, J. J. and Bakhuizen van den Brink, R. C.** 634.1/8(92)
Fruit and fruit culture in the Dutch East Indies. (English edition of Vruchten en Vruchtenteelt in Nederlandsch-Oost-Indië.) 1931, G. Kolff, Batavia, gldrs. 17.50, pp. 180.

This book deals with 57 species of tropical fruits, each being illustrated by an excellent coloured plate by a Javanese artist. Notes are given on the propagation, cultivation, uses, pests and diseases of each variety. The book is the more acceptable in that, while dealing faithfully with the commoner species, it pays equal attention to a large number of tropical fruits, which are not so well known but which none the less seem to have commercial possibilities.